

AESTHETIC PREFERENCES FOR COMBINATIONS OF COLOR AND MUSIC¹

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Summary.—135 university undergraduates heard 12 preludes from J. S. Bach's *Well-tempered Clavier* (Vol. 1) while viewing alternating red, yellow, green, and blue colored lights. Their task was to rank-order the lights according to how well they "matched" the music. Preferences for combinations of color and music differed depending on whether the music was in a major or a minor key. The present findings along with those of some earlier studies suggest that aesthetic experience may be heightened when colors are seen that match the mental images music evokes.

This study concerns chromesthesia, a cross-modal perceptual phenomenon in which color images are evoked by auditory stimuli. The extensive scientific literature on chromesthesia (see Marks, 1975) indicates that the images are most readily evoked by simple sounds such as vowels or musical tones. The particular links are what one might expect: sounds that are loud and of high pitch tend to evoke bright colors, whereas sounds that are soft and of low pitch tend to evoke darker colors. When the stimuli are actual pieces of music the characteristics of the images are more difficult to predict, but they appear to be mediated by attributes that are common to both color and music.

This study was stimulated by earlier ones (Polzella & Biers, 1987; Polzella & Kuna, 1981) in which links between musical attributes, e.g., major versus minor key, and color images were demonstrated in samples of Baroque music. The procedure in those studies was straightforward. Subjects listened to a series of musical excerpts and, following each excerpt, they were to "choose the one color, red, yellow, green, or blue, that was most apparent while [they] were listening." They then rated both the intensity of that color image and the degree to which they enjoyed listening to the excerpt. The results indicated that yellow images were more likely to be reported in response to pieces in major keys, whereas green or blue images were more likely to be reported in response to pieces in minor keys.

The objective of the present study was to assess whether particular combinations of color and music can differentially affect aesthetic experience. This is a plausible objective for two reasons. First, we know from our earlier studies that individuals readily report imagining colors while listening to music and that these colors are associated with attributes of the music. Second, there is musicological evidence that colors are associated with musical attributes. Beethoven and Rimsky-Korsakov associated particular keys with colors, for example (Marks, 1975, pp. 314-315), and Alexander Scriabin (1872-1915) even included a part for "light organ" in his symphony "Prometheus." When a note was played on this device, instead of hearing a tone, one would see a particular hue. Conventional pitches, e.g., C, D, E, etc., were linked to hues according to a scheme devised by the composer. The organ was used to project colored

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lights on a screen while the symphony was being played, and changes in the hue and intensity of the lights were executed to reflect or blend with melodic, harmonic, and rhythmic aspects in the music (Peacock, 1985).

Method.—The participants were 135 undergraduate students (65 men, 70 women) who were enrolled in the introductory psychology course at the University of Dayton. They participated to help fulfill a research requirement for that course.

The musical stimuli consisted of piano recordings (CBS D3S-733) of 12 of the 24 preludes contained in J. S. Bach's Well-tempered Clavier (Vol. I). Six of the preludes were in major keys, and six were in corresponding minor keys. Colors were projected as slides constructed from standard theatrical lighting filters. They included red (Roscolene No. 823, luminance = 16.3 cd/m²), yellow (Lee No. 101, luminance = 52.3 cd/m²), green (Roscolux No. 90, luminance = 6.8 cd/m²), and blue (Roscolene No. 863, luminance = 2.0 cd/m²).

Subjects, who were run in small groups of three to eight, heard one of two randomly ordered sequences of all of the preludes in a darkened room while watching the color slides for about 30 min. The slides randomly alternated among red, yellow, green, and blue, each color being visible in turn for 5 sec. The interval between successive colors was approximately 2 sec. The alternation continued until the end of a prelude at which point subjects rank-ordered the colors from 1 to 4 to reflect the extent to which each "matches or goes best with the musical excerpt."

Results and discussion.—The rankings were averaged over each group of stimuli yielding mean color preferences for the preludes in major and minor keys. These are shown in Table 1. Each set of means was analyzed using the Friedman 2-way analysis of variance. There were color preferences within both sets of preludes significantly associated [$\chi_3^2(N=135)=105.23, p<.001, \eta^2=.20; \chi_3^2(N=135)=21.79, p<.001, \eta^2=.04$, respectively]. Multiple comparisons (Holland & Wolfe, 1973) showed clear evidence of specific preferences for pairs of colors and keys. For the major-key preludes, yellow and green were preferred over red and blue ($p<.01$), whereas for the minor-key preludes, green was preferred over all other colors ($p<.01$).

TABLE 1

MEAN RANKED PREFERENCE AND STANDARD DEVIATION FOR COLOR/MUSIC COMBINATIONS

Key	Color							
	Red		Yellow		Green		Blue	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Major	1.8	0.5	2.9	0.4	3.2	0.4	2.1	0.4
Minor	2.5	0.5	2.2	0.6	2.9	0.4	2.4	0.6
<i>M</i>	2.2	0.5	2.5	0.5	3.1	0.4	2.2	0.5

Note.—Mean rankings (low to high) were transformed to reflect lesser to greater preference for color/key combination.

The results indicate that particular combinations of color and music are differentially associated with aesthetic preference. The results complement those of previous experiments, which showed that music in a major key tends to evoke "yellow" as a mental image, whereas music in a minor key tends to evoke "green" (Polzella & Biers, 1987; Polzella & Kuna, 1981). However, in contrast to the earlier findings, green seemed to be strongly preferred for pieces in both major and minor keys. The reason for this discrepancy is not clear, although one explanation could involve methodological differences. In the earlier studies, participants were instructed to *imagine* colors; in the present study they were *shown* colors. These are not directly comparable experiences. Indeed, since the spectral characteristics of the colors were not controlled in the present study, it is possible that the color preferences may have been mediated by characteris-

tics other than, or, in addition to, hue. Also, here mean color preferences averaged over each group of stimuli for major and minor pieces were used. Additional research is needed to clarify this issue.

Considered together, the results suggest an intriguing question, which could be addressed in subsequent research, *viz.*, is aesthetic experience heightened when colors are seen that match the mental images that the music evokes?

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